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Evaluation of the selective use of abdomino-pelvic drains at laparoscopic myomectomy: in enhanced recovery, do drains delay discharge home?

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ABSTRACT

Objective: To assess whether the use of abdominal drains at laparoscopic myomectomy (LM) influences length of hospital stay. The primary outcome was to determine whether the use of intra-abdominal drains after LM was associated with prolonged hospital stay after surgery. Secondary outcomes were to identify factors that influence the use of abdomino-pelvic drains during LM.

Study design: Retrospective cohort study of 217 consecutive single surgeon LMs in a London university teaching hospital. Abdominal drains were used selectively after LM. Of the 217 patients, 123 (57%) had a drain left *in situ* at the end of the operation.

Results: The two cohorts of patients were not significantly different in their demographics. The use of a drain was significantly associated with an increased number of fibroids (4.6 ± 3.8 *vs.* 2.8 ± 2.1, $p < 0.0001$), increased weight of fibroids (277 ± 211 g *vs.* 133 ± 153 g, $p < 0.0001$), increased surgical time (133 ± 40 min *vs.* 90 ± 35 min, $p < 0.0001$) and increased estimated blood loss (406 ± 265 ml *vs.* 199 ± 98 ml, $p < 0.0001$). There was no statistically significant difference in length of hospital stay (mean duration of admission 2.1 days $\pm$ 0.98 with drain, *vs.* 2.1 days $\pm$ 0.97 without a drain, $p = 0.98$).

Conclusion: We conclude that although the use of a drain may be associated with a more complex operation, this does not delay the patient's discharge.

Introduction

Uterine fibroids are the commonest benign tumour in women. By the age of 50, 80% of Afro-Caribbean and 70% of Caucasian women will have at least one fibroid [1]. Fibroids can present with a variety of symptoms and have a significant impact on quality of life [2]. Such symptoms include menorrhagia, subfertility, pressure symptoms and, on occasion, pain, depending on the location of the fibroids [3,4].

The vast majority of fibroids are asymptomatic, and historically treatments have been aimed at only symptomatic patients. Traditionally, abdominal hysterectomy was the treatment for symptomatic fibroids. However, since the first myomectomy performed by Atlee in 1845 [5], and the popularisation of the technique by Bonney in the late 1920s [6], more women have opted for this organ-preserving technique in order to preserve fertility. Following the first laparoscopic myomectomy (LM) by Semm in 1979 [7], LM has been shown to have advantages over open myomectomy in carefully selected women [8]. It is now regarded as the gold standard for certain categories of women with certain fibroids [9].

Enhanced recovery has been introduced into surgical care to improve patient pathways. It is a model of care for elective surgery that facilitates rapid patient recovery and shorter hospital stay, without an increase in complications or readmissions [10,11]. Therefore, as a minimally invasive procedure, LM lends itself to enhanced recovery.

Abdomino-pelvic drains are used selectively during surgery to facilitate the diagnosis of secondary haemorrhage, and prevent haematoma formation and abscess formation [12]. At times if clinically indicated, myomectomy may necessitate the use of an intra-abdominal drain. It has been suggested that the use of drains may prolong the duration of hospital admission after surgery [10,11]. Guidance on enhanced recovery in gynaecology strongly

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supports minimal access surgical techniques, but advises that routine use of drains has "limited benefit and should be avoided as they increase morbidity and prolong hospital stay" [10]. However, the use of intra-abdominal drains after LM has never been evaluated.

Materials and methods

Objectives

The primary outcome was to determine whether the use of intra-abdominal drains after LM was associated with prolonged hospital stay after surgery. Secondary outcomes were to identify factors that influence the use of abdomino-pelvic drains during LM.

Study design

A retrospective cohort study of 217 LMs between 2005 and 2013 at Whipps Cross University Hospital, London was performed. All study cases were performed by a single surgeon (FO).

Exclusion criteria for consideration of myomectomy *via* the laparoscopic route include: confirmed or suspected malignant disease of any part of the genital tract, uterine size above 28 weeks and the presence of more than 10 fibroids on pelvic imaging.

The technique for LM has been described previously [13]. Initial entry was *via* an intraumbilical incision or at Palmers point if the uterus was thought to be clinically large, with two 5 mm ancillary lateral ports for operating, and a suprapubic port. Misoprostol (800 mcg per rectum) and Vasopressin™ (in 1:30 to 1:60 of saline) intramyometrial infiltration were used intra-operatively to reduce blood loss. Fibroid excision was predominantly carried out using the Harmonic™ scalpel (Ethicon) with 2 or 3 layers closure of the resulting defect using no. 1 polyglactin intracorporeal (Polysorb ™, Covidien, UK) sutures and for the serosa monofilament sutures (Biosyn™, Covidien, UK). Myomas were then removed *via* the suprapubic port following morcellation. Site-specific adhesion barriers (Sprayshield™, Covidien, UK) were used to minimise post-operative adhesions.

An 18-20F Robinson intra-abdominal drain (Smiths Medical International, USA) was left *in situ* at the end of surgery when it was thought to be clinically indicated. The protocol indicated that patients were reviewed in the morning on the first day following surgery and the drain was removed when clinically appropriate. This occurred when there was less than 100 ml in the drain or when there was only serous fluid in the tube. For the majority of patients this would be on the morning after surgery, but on occasion the drain may be left *in situ* until subsequent review.

Data were collected prospectively and entered onto a database. Patient demographic details were collated, including age, body mass index (BMI), ethnicity, parity, past surgical history and indication for surgery. Pre-operative assessment of the fibroids was documented, including previous treatment and size of fibroids, both clinically and on ultrasound. Surgical details were recorded, such as duration of surgery, estimated blood loss, number and weight of fibroids removed and any additional procedures performed. Post-operative data included immediate post-operative complications, drop in haemoglobin, blood transfusion and day of discharge.

Statistical analysis

Data were collected and stored on an Excel spreadsheet, adhering to Caldicott guidelines. Parametric tests were used, as all data passed the test of normality. Student's *t*-test was used for numerical data and Fisher's exact test for categorical data. Significance was set at a p-value of <0.05. Analysis was performed using Graphpad Prism, Version 6.0 (Graphpad software, San Diego, USA).

Results

A total of 217 LMs were performed between 2005 and 2013, of which 123 patients (57%) had a drain left *in situ* at the end of the operation: 94 (43%) patients did not have a drain. There was no significant difference in age, BMI or ethnicity between the groups with and without an intra-abdominal drain. There was a significantly greater proportion of nulliparous women in the group in which a drain was left *in situ* (Table 1).

The use of a drain was significantly associated with an increased number of fibroids (4.6 ± 3.8 *vs.* 2.8 ± 2.1, $p < 0.0001$) and increased weight of fibroids (277 ± 211 g *vs.* 133 ± 153 g, $p < 0.0001$) (Table 3). Women in whom a drain was left *in situ* were significantly more likely to have had 6 or more fibroids removed and/or a dominant fibroid >5 cm diameter, and/or their fibroids were more likely to be intramural (Table 2). In contrast, women without a drain were significantly more likely to have had only one fibroid removed (Table 2). Additional procedures performed were not associated with the use of a drain (Table 2).

Table 1
Baseline characteristics of study participants.

Baseline characteristics	With drain Mean (SD)	Without drain Mean (SD)	OR or mean difference	95% CI	*p*-Value
[a]Age (years)	38.4 (5.4)	37.5 (5.4)	−0.91	−2.38 to 0.56	0.22
[a]BMI (kg/m^2)	27.1 (4.5)	26.3 (5.8)	−0.82	−2.39 to −0.76	0.31
[b]Nulliparity (%)	74.8 (92/123)	59.8 (55/92)	**2**	**1.12 to 3.58**	**0.03**
[b]Ethnicity (%)					
Afro-Caribbean	66.7 (82/123)	55.3 (52/94)	1.62	0.93 to 2.81	0.09
Caucasian	22.8 (28/123)	28.7 (27/94)	0.73	0.36 to 1.35	0.35
Asian	10.6 (13/123)	14.9 (14/94)	0.68	0.30 to 1.51	0.41
[b]Indication (%)					
Bleeding	38.0 (46/121)	44.1 (41/93)	0.78	0.44 to 1.34	0.4
Pain	30.6 (37/121)	21.5 (20/93)	1.61	0.86 to 3.0	3
Subfertility	25.6 (31/121)	34.4 (32/93)	0.66	0.36 to 1.2	0.18
Pressure	6.6 (8/121)	1.1 (1/93)	6.5	0.80 to 53.06	0.08
Urinary symptoms	1.7 (2/121)	0 (0/93)	3.9	0.19 to 82.54	0.51

Results in bold highlights indicate statistical significance.
BMI: body mass index.
[a] Data shown as mean (SD) and analysed by Student's *t*-test, with mean difference and 95% confidence interval.
[b] Other data shown as % and analysed by Fisher's exact test with odds ratio (OR) and 95% confidence interval.

Table 2
Details of fibroids removed at LM.

Parameters of removed fibroids	With drain (%)	Without drain (%)	OR	95% CI	*p*-Value
Number of fibroids					
1	21.2 (25/118)	39.1 (36/92)	**0.42**	**0.23–0.77**	**0.006**
2–5	50.8 (60/118)	50.0 (46/92)	1.03	0.60–1.79	1.00
≥6	28.0 (33/118)	10.9 (10/92)	**3.18**	**1.47–6.88**	**0.003**
Location of dominant fibroid					
Intramural	42.3 (52/123)	16.7 (15/90)	**3.66**	**1.89–7.09**	**<0.0001**
Subserous	17.1 (21/123)	13.3 (12/90)	1.34	0.62–2.89	0.57
Submucous	4.9 (6/123)	3.3 (3/90)	1.49	0.36–6.11	0.74
Dominant fibroid >5 cm	81.8 (90/110)	58.5 (48/82)	**3.19**	**1.66–6.13**	**0.0006**
[a]Additional procedure	37.4 (46/123)	36.2 (34/94)	1.05	0.60–1.84	0.89

Results in bold highlights indicate statistical significance.
Data shown as % and analysed by Fisher's exact test with odds ratio (OR) and 95% confidence interval.
[a] Additional procedures carried out were: excision of endometriosis, ovarian cystectomy, polypectomy, adhesiolysis, and trans-cervical resection of fibroid.

Furthermore, drains were associated with more complex surgery reflected by increased surgical time (133 ± 40 min *vs.* 90 ± 35 min, $p < 0.0001$), higher estimated blood loss (406 ± 265 ml *vs.* 199 ± 98 ml, $p < 0.0001$) and greater post-operative drop in haemoglobin (1.63 ± 1.31 g/dl *vs.* 1.18 ± 0.90 g/dl) (Table 3).

Despite being associated with more complex surgery, the use of a drain did not delay discharge home. There was no statistically significant difference in the length of hospital stay (duration of admission 2.1 days ± 0.98 with drain, *vs.* 2.1 days ± 0.97 without a drain, $p = 0.98$) (Table 3).

As the only difference between the two populations studied was nulliparity, in order to investigate whether nulliparity was associated with the use of a drain, a subgroup analysis was performed to compare surgical outcomes in nulliparous women with and without a drain (Table 4). This gave the same results as the whole group analysis; specifically, the use of a drain was significantly associated with an increased number, size and weight of fibroids. Surgical time, estimated blood loss and drop in haemoglobin were all significantly higher in women in whom a drain was left *in situ*. Similarly to the whole group analysis, there was no significant difference in the duration of hospital admission. Therefore, parity in itself is unlikely to be associated with whether a drain is left *in situ* and nulliparous women are more likely to have a drain left *in situ* due to more complex fibroid surgery.

In the group who had a drain left *in situ*; three patients received a post-operative blood transfusion, one of these patients was discharged on day 2 and one on day 3. The third patient had an estimated blood loss during surgery of 1200 ml. Post-operatively her haemoglobin had significantly dropped to 7.2 g/dl, from 14 g/dl pre-operatively. She had an exploratory laparotomy and following this she was discharged on day seven. There were no other cases of return to theatre. Regarding other complications, there were two cases of conversion to mini-laparotomy – one due to desaturation and difficulty ventilating the patient. Additionally, there was one case of omental herniation and one case of urinary retention.

In the group who did not have a drain left *in situ*, there was one case necessitating blood transfusion and this patient was discharged on day three. There were no cases of return to theatre and no intra-operative conversions to laparotomy. However, there were two port site hernias, one omental herniation and one case of urinary retention.

Table 3
Surgical findings and outcomes.

Intra- and post-operative findings	With drain Mean (SD)	Without drain Mean (SD)	Mean difference	95% CI	*p*-Value
Number of fibroids	4.58 (3.8)	2.79 (2.1)	−1.79	−2.60 to −0.98	**<0.0001**
Size of dominant fibroid (cm)	8.53 (2.9)	6.56 (2.5)	−2.32	−3.10 to −1.53	**<0.0001**
Weight of fibroids (g)	277 (221)	133 (153)	−185.2	−137.7 to −232.6	**<0.0001**
Surgical time (min)	133 (40)	90 (35)	−42.82	−31.73 to −53.91	**<0.0001**
Estimated blood loss (ml)	406 (265)	199 (98)	−219.8	−271.3 to −168.4	**<0.0001**
Drop in haemoglobin (g/dl)	1.63 (1.31)	1.18 (0.90)	−0.44	−0.77 to −0.11	**0.0093**
Day of discharge	2.1 (1.0)	2.1 (1.0)	−0.015	−0.28 to 0.25	0.91

Results in bold highlights indicate statistical significance.
Data shown as mean (SD) with mean difference and 95% confidence interval and analysed by Student's *t*-test.

Table 4
Subgroup analysis for nulliparous women: surgical findings and outcomes.

Intra- and post-operative findings	Nullips with drain ($n = 92$) Mean (SD)	Nullips without drain ($n = 55$) Mean (SD)	Mean difference	95% CI	*p*-Value
Number of fibroids	4.70 (3.3)	2.89 (2.2)	−1.81	−2.71 to 0.91	**0.0001**
Size of dominant fibroid (cm)	8.59 (2.9)	6.63 (3.0)	−1.96	−3.0 to −0.90	**0.0004**
Weight of fibroids (g)	289 (232)	134 (159)	−154.90	−222.8 to −87.08	**<0.0001**
Surgical time (min)	137 (39)	94 (37)	−42.95	−57.18 to −28.72	**<0.0001**
Estimated blood loss (ml)	433 (274)	199 (97)	−234.30	−298.0 to −170.5	**<0.0001**
Drop in Hb (g/dl)	1.69 (1.38)	1.08 (0.91)	−0.61	−1.02 to −0.20	**0.0037**
Day of discharge	2.15 (0.93)	2.17 (1.08)	0.019	−0.34 to 0.37	0.91

Results in bold highlights indicate statistical significance.
Data shown as mean (SD) with mean difference and 95% confidence interval and analysed by Student's *t*-test.

Comment

Enhanced recovery is a model of care for elective surgery, to facilitate rapid patient recovery and shorter hospital stay, without an increase in complications or readmissions. It is advantageous for patients, whilst also promoting cost-effectiveness at a financially challenging time within the National Health Service in the United Kingdom [14].

Though the use of abdominal drains may have advantages, it has been suggested that their use may delay discharge home after surgery by hindering post-operative mobilisation and increasing pain, if inadequately controlled [10,11]. Furthermore, if not promptly removed, drains may be associated with secondary infections [15,16]. If true, this would detract from the widely recognised advantages of minimal access surgery, including shorter hospital stay and quicker recovery [4,17].

This study is the first to investigate the use of abdominal drains after LM. We have clearly demonstrated that although the use of a drain may be associated with more complex surgery, it does not delay discharge home.

We used uterine size greater than 28 weeks and the presence of more than 10 fibroids on pelvic imaging as our exclusion criteria. Based on the surgical expertise in our unit, we were able to provide laparoscopic removal safely and consistently to women with uterine size less than 28 weeks and with less than 10 fibroids. We acknowledge the presence of various guidelines in the past advocating a lesser uterine size and number of fibroids such as the guideline from the National College of Obstetricians and Gynaecologists in France [18]. As yet, however, there is no consensus in the literature as to a universal safe limit and individual surgeons have so far been guided by the limitations of their own surgical skills [19,20]. Studies by Sinha et al. [21] and Sankaran and Odejinmi [13] have demonstrated that the difficulties posed by large fibroid size and numbers can be overcome by surgical exposure and the cumulative effects of training.

The majority of patients had multiple fibroids, and some of these patients underwent concomitant transcervical resection of submucous fibroids and LM. LM was used solely where there were multiple fibroids and the submucous fibroid was more than 5 cm and thus not amenable to trancervical resection. The literature supports the management of large submucous fibroids by LM [22–24].

There were two port-site hernias and one omental herniation as our complications. All ports more than 5 mm size were closed by endoclose with no. 1 Vicryl and the umbilical port was closed with a deep Vicryl Rapide suture to include the sheath. The hernias noted above were earlier in the series and we have not had any hernias since following this closure method [25].

All our patients were robustly counselled pre-operatively regarding enhanced recovery and were encouraged to go home on day one post-operatively. Furthermore our patients were provided with adequate analgesia and were promptly reviewed on the morning after surgery. We did not prospectively collect data on volumes in the drain but the post-operative protocol was such that if there was less than 100 ml the drain could be removed. By strictly adhering to this protocol of management, unnecessary delays in discharging patients home were prevented. Therefore, the use of an abdominal pelvic drain did not delay patient discharge from hospital.

Although the use of abdominal drains after LM has not previously been studied, there have been a number of studies evaluating LMs. Paul et al. performed a large study of 762 LMs, in which every patient had an intra-abdominal drain left *in situ* at the end of the operation. In this cohort, one patient required re-laparotomy for post-operative bleeding, detected by excessive bleeding through the drain. The average hospital stay was 1.3 days [26]. Sizzi et al. reported on one of the largest series of LMs ($n = 2050$), in which there was no mention of prophylactic use of a drain [27]. The mean length of hospitalisation was 1.99 days. Our duration of admission in this cohort where drains were selectively used was 2.1 days, which is comparable to these results. This suggests that use of drains does not increase the period of hospitalisation. In this study by Sizzi et al., there were 14 cases of haemorrhage (0.7%), three cases of blood transfusion (0.14%), and two cases of return to theatre (0.09%) [27]. Our complication rate is consistent with these studies, as we had one case of a return to theatre for re-laparotomy. There were, however, four cases of post-operative blood transfusion out of the total study population of 217 patients (1.8%). This higher rate of blood transfusion in our study could be due to lower pre-operative haemoglobin in our study population. This suggests that usage of drains does not increase complication rates.

Our results are consistent with these studies and suggest that leaving a drain *in situ* is not associated with prolonged postoperative hospitalisation or increased complication rate.

It could be argued that it is altogether unnecessary to use drains after laparoscopic myomectomy, considering that previous studies have shown it to be associated with reduced blood loss. However, most minimally invasive laparoscopic procedures follow the same fundamental principles as open surgery with the added benefit of laparoscopy. One of the principles of myomectomy, whether laparoscopic or open, is that if there is a possibility of secondary haemorrhage caution should be taken and a drain inserted. Myomectomies are fraught with a high risk of bleeding. A requirement for transfusion in up to 20% of cases after abdominal myomectomy has been reported in the literature [28]. Traditionally the risk of secondary bleeding has always been assessed by the use of abdominal drains. There is robust evidence in literature that this practice is being continued by surgeons while performing myomectomies *via* laporotomy [29] as well as through the laparoscopic route [30].

The scope of our study was to investigate whether patients in whom a drain is inserted after LM stay longer in hospital, and not to identify factors that would lead to secondary haemorrhage after laparoscopic myomectomy.

The strength of our study is that a protocol was followed: patients were counselled regarding day of discharge and were promptly reviewed. Another strength is that these are single-surgeon data, and thus surgical technique was consistent.

A weakness of our study is that although the data were collected prospectively, the patients were not randomised. A large number of patients would have been required for prospective randomisation to take into account factors such as location, position, size and number of fibroids.

In conclusion, when used in conjunction with good surgical techniques, measures to decrease blood loss, appropriate case selection, adequate analgesia, patient education and prompt patient review post-operatively, the use of an abdomino-pelvic drain does not prolong hospital stay or have a negative impact on enhanced recovery in gynaecology.

Conflict of interest

The authors report no conflict of interest.

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